REMARKS

Claims 1-3, 5-7 and 9-22 and 24-26 are currently pending, of which claims 1-3, 5-7, 9, 10, 18, 20 and 21 have been withdrawn from consideration. Claim 23 has been canceled and claims 19 and 22 have been amended. Reconsideration of the above-identified patent application, in light of the above amendments and following remarks, is respectfully requested.

Claim 19 has been amended to eliminate the recitation of an aluminum core, and thereby reduce the number of issues remaining, and to correct a typographical error. Support for these amendments is found throughout the Specification and Drawings, as filed.

Claim 22 has been amended to remove a redundancy in light of the amendments made to independent Claim 19. Support for this amendment is found throughout the Specification and Drawings, as filed.

As now claimed, Applicant's invention is directed to a method for manufacturing a suspension bar for a permanent cathode used in an electrolysis of metals. The method comprises forming the suspension bar from an outer jacket tube consisting essentially of acid-resistant steel or stainless steel and a highly electroconductive core consisting essentially of copper by casting the core in molten form inside the outer jacket tube for a time sufficient to form a metallurgical bond between the outer jacket and the core, and then machining the outer jacket partially open from at least one end of the suspension bar to expose the core.

Former Claims 12, 13, 19, 22 and 23 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,606,804 to Schulke et al. ("Schulke"), in view of

U.S. Patent No. 4,901,906 to Kvavle ("Kvavle"). Claim 23 has been canceled, thereby rendering moot the rejection of this claim.

Schulke describes an electrode assembly having a corrugated panel member to provide increased stability. Kvavle describes a method for forming composite metal articles in which a relatively low melting temperature metal is placed inside a shell of a relatively higher melting temperature metal.

The May 20, 2004 Office Action argues that Schulke discloses a method of manufacturing a suspension bar 20, steel outer jacket tube 16; copper or aluminum core; machining the outer jacket. However, Schulke states clearly that the lesser electrically conductive material of the cladding 16 is "a valve metal selected from the group of titanium, tantalum, niobium and the like, and the alloys thereof" (Schulke, col. 3, lines 36-41). Steel typically includes amounts of iron, carbon, manganese, tin, silicon and phosphorous. Alloys of steel may further or alternatively include amounts of chromium, nickel, tungsten, molybdenum or vanadium. While an alloy of steel may contain trace mounts of valve metals, acid-resistant steel and stainless steel are not valve metals or alloys of valve metals. Therefore, the teaching by Schulke of a titanium, tantalum or niobium (or alloy thereof) cladding does not teach or suggest the claimed acid-resistant or stainless steel outer jacket recited in independent Claim 19.

The Office Action acknowledges that Schulke does not disclose casting the core in molten form, but argues that it would have been obvious to cast the core in molten form in Schulke, as taught by Kvavle. The Office Action refers to an embodiment of Kvavle, which describes a method for making containerized ingots wherein molten aluminum is injected under pressure into a shell, which is held in position by clamps (Kvavle, col. 6, line 64 to col. 7, line 2).

Applicant does not claim a method using clamps. In contrast, Applicant's method does not require the use of clamps, as described in Kvavle, and as amended, does not claim use of aluminum as a core material.

A combination of Kvavle with Schulke is not obvious. Schulke does not teach or suggest the use of casting to form a core. Although the cladding in Schulke is illustrated as extending to and over one of the oppositely opposed ends of the hanger member bars 20, said cladding can terminate at said end leaving the core 15 of the electrically conductive metal exposed (Schulke, col. 3, lines 23-29). Accordingly, it would not be possible to form the core of Schulke by casting, since if a core were cast in an outer jacket, it could not extend beyond the limits of the jacket.

The Office Action proposes combining Schulke and Kvavle such that the closed-end hanger bar (20) of Schulke (see Figures 1 and 4), prior to the "cutting" of engaging means (12) of Schulke, is combined with the injection casting of Kvavle (as shown, for example in Figures 13 and 14 of Kvavle). This injection casting method of Kvavle requires that an outlet/ scavenging port (e.g., 54, 67) initially be open at an opposite end from the injection port (e.g, 53, 66), and then be closed to build up pressure in the charge (Kvavle, col. 7, lines 1-39).

If Schulke and Kvavle were combined, as proposed by the Office Action, additional modifications would necessarily be required to the hanger bar (20) of Schulke in order to adapt the bar (20) to the casting method of Kvavle. Such modifications would result in a bar that is not closed prior to the cutting of engaging means (12) (Schulke, Fig. 4), and thus susceptible to any corrosive environment to which it may be exposed.

Moreover, if the teachings of these references were combined, injection of a core metal would still be injected within a shell of titanium, tantalum, niobium and the like, or alloys thereof, not of acid-resistant steel of stainless steel, as claimed by applicants. In sum, Schulke teaches away from manufacture involving casting, and thus teaches away from combination with Kvavle.

Schulke and Kvavle do not teach or suggest, alone or in combination, a "method for manufacturing a suspension bar for a permanent cathode used in an electrolysis of metals, comprising forming the suspension bar from-an outer jacket tube consisting essentially of acid-resistant steel or stainless steel and a highly electroconductive core consisting essentially of copper, by casting the core in molten form inside the outer jacket tube for a time sufficient to form a metallurgical bond between the outer jacket and the core, and then machining the outer jacket partially open from at least one end of the suspension bar to expose the core," as recited in independent Claim 19, as amended. Therefore, independent Claim 19 and all claims depending therefrom define patentable subject matter over Schulke and Kvavle, considered alone or in combination. Withdrawal of the rejection applied to former Claims 12, 13, 19 and 22 under 35 U.S.C. §103(a) as being unpatentable over Schulke, in view of Kvavle, is respectfully requested. Claim 23 has been canceled, thereby obviating the rejection of this claim.

Former Claim 24 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle as applied to Claims 19, 22 and 23, further in view of

U.S. Patent No. 4,733,849 to Golz ("Golz"). The deficiencies of Schulke and Kvavle are set forth above. Golz does not remedy these deficiencies.

Golz describes a mold for manufacturing of grid plates for lead batteries. Graphite is used as a coating inside the mold. However, Golz does not teach or suggest immersing the whole mold in molten metal. Accordingly, there is no teaching or suggestion for coating the outside of the mold of Golz with graphite. Thus, in combination with Schulke and Kvavle, this feature is still not taught or suggested, since no reference teaches nor suggests immersion in a melt as a means for casting (recited in Claim 15).

Schulke, Kvavle and Golz do not teach or suggest, alone or in combination, "coating the outer surface of the outer jacket tube with graphite to prevent the molten core from adhering to the outer surface of the outer jacket," as recited in claim 24, as amended. Moreover, Kvavle and Golz do not teach or suggest, alone or in combination, "casting by immersing the outer jacket into a melt of the core," as recited in Claim 15, as amended. Therefore, independent Claim 24 (and Claim 15) defines patentable subject matter over Schulke, Kvavle and Golz, considered alone or in combination. Withdrawal of the rejection applied to former Claim 24 under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle, further in view of Golz, is respectfully requested.

Former Claims 14, 25 and 26 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle as applied to Claims 19, 22 and 23, further in view of U.S. Patent No. 3,648,757 to Willingham ("Willingham"). The deficiencies of Schulke and Kvavle are set forth above. Willingham does not remedy these deficiencies.

Willingham describes making a multi-layer mold for iron pipe manufacturing. A mandrel 10, which has the configuration of the pipe to be cast, is first applied with a coating such as tin or lead to a thickness of 0.0005 in. After that, a low-stress material such as nickel, copper or cobalt is electro-deposited on the coating. The electro-depositing is continued until a sleeve 15 is formed on the mandrel. The mandrel with the sleeve thereon is placed within a form 16, which functions as a mold. A molten metal like aluminum, magnesium or the like is poured around the mandrel, between the mandrel and the form/mold (16) and allowed to harden to form an outer layer. Later, the assembly (including metal 18) is removed from the form (16). See Willingham col. 3. lines 54-55, 63-64, 69-72 and col. 4, lines 8-10). In short, Willingham describes forming the jacket onto the *outside* of a "core" by casting.

Willingham describes a separate mold for casting. Willingham does not teach or suggest forming a core inside a jacket using the jacket as a mould, as claimed. As such, the "hole" pointed to by the Examiner in Figure 4 of Willingham is not in the "jacket" as claimed by Applicant in Claim 25. Therefore, in addition to not remedying the deficiencies of Schulke and Kvavle, Willingham does not teach or suggest "making one hole in the upper side at either end of the outer jacket tube," as recited in Claim 25, as amended.

Schulke, Kvavle and Willingham do not teach or suggest, alone or in combination, a "method for manufacturing a suspension bar for a permanent cathode used in an electrolysis of metals, comprising forming the suspension bar from-an outer jacket tube consisting essentially of acid-resistant steel or stainless steel and a highly electroconductive core consisting essentially of copper, by casting the core in molten form inside the outer jacket tube for a time sufficient to form a metallurgical bond between the outer jacket and the core, and then

machining the outer jacket partially open from at least one end of the suspension bar to expose the core," as recited in independent Claim 19, as amended. Therefore, independent Claim 19 and all claims depending therefrom, including Claims 14, 25 and 26, define patentable subject matter over Schulke, Kvavle and Willingham, considered alone or in combination. Withdrawal of the rejection applied to former Claims 14, 25 and 26 under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle, further in view of Willingham, is respectfully requested.

Former Claim 11 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle as applied to Claims 19, 22 and 23, further in view of JP 58038654A to Kawahara et al. ("Kawahara"). The deficiencies of Schulke and Kvavle are set forth above. Kawahara does not remedy these deficiencies.

Kawahara describes a method in which an iron or steel part, plated with nickel, is first preheated. Later, molten aluminum is cast over the nickel plated iron part. While pre-heating occurs in Kawahara, the preheating of Kawahara is not heating of the outer jacket but rather, heating of the core. Accordingly, Kawahara does not teach or suggest the subject matter of Claim 11.

Schulke, Kvavle and Kawahara do not teach or suggest, alone or in combination, "preheating the outer jacket tube before casting molten core inside the outer jacket tube," as recited in claim 11, as amended. Therefore, Claim 11 defines patentable subject matter over Schulke, Kvavle and Kawahara, considered alone or in combination. Withdrawal of the rejection applied to former Claim 11 under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle, further in view of Kawahara, is respectfully requested.

Former Claims 15, 16 and 17 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle as applied to Claims 19, 22 and 23, and further in view of U.S. Patent No. 5,005,631 to Dwivedi ("Dwivedi"). The deficiencies of Schulke and Kvavle are set forth above. Dwivedi does not remedy these deficiencies.

Dwivedi describes an infiltration process in which a filler material contacts a preform and the preform is partly immersed to molten matrix metal in order to infiltrate the preform with the matrix metal. The infiltration process of Dwivedi does not teach or suggest the claimed casting method. Regarding Claim 16, the Office Action refers to Fig. 3 in Dwivedi as being in a "horizontal" position but the specification of Dwivedi does not give any verification to the hypothesis. Rather, the main axis of the preform (22) is oriented vertically. Moreover, Dwivedi aims to maintain an infiltrating atmosphere inside the perform, which is not possible if the perform is totally immersed in the matrix metal. Accordingly, Dwivedi teaches away from "casting" by immersion in a melt.

Accordingly, Dwivedi does not remedy the deficiencies of Schulke and Kvavle, nor does Dwivedi teach or suggest "immersing the outer jacket tube in the melt essentially in a horizontal position, with the ends of the jacket being closed and making a sufficient number of holes in the upper part of the jacket for feeding the melt into and releasing air from the outer jacket tube," as recited in amended Claim 16.

Schulke, Kvavle and Dwivedi do not teach or suggest, alone or in combination, a "method for manufacturing a suspension bar for a permanent cathode used in an electrolysis of

metals, comprising forming the suspension bar from-an outer jacket tube consisting essentially of acid-resistant steel or stainless steel and a highly electroconductive core consisting essentially of copper, by casting the core in molten form inside the outer jacket tube for a time sufficient to form a metallurgical bond between the outer jacket and the core, and then machining the outer jacket partially open from at least one end of the suspension bar to expose the core," as recited in independent Claim 19, as amended. Therefore, independent Claim 19 and all claims depending therefrom define patentable subject matter over Schulke, Kvavle and Dwivedi, considered alone or in combination. Withdrawal of the rejection applied to former Claims 15, 16 and 17 under 35 U.S.C. §103(a) as being unpatentable over Schulke and Kvavle, in view of Dwivedi, is respectfully requested.

CONCLUSION

In light of the foregoing, Applicant respectfully submits that all claims, as currently presented, define patentable subject matter over the prior art of record. Entry of this Amendment After Final Rejection and allowance of all claims is earnestly solicited.

Respectfully submitted,

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Dated: July 20, 2004

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